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TERMINAL (ENTER 1, 2, 3, OR ?):2

* * * * * * * * * * Welcome to STN International * * * * * * * * * *

NEWS 1		Web Page for STN Seminar Schedule - N. America
NEWS 2	MAR 31	IFICDB, IFIPAT, and IFIUDB enhanced with new custom IPC display formats
NEWS 3	MAR 31	CAS REGISTRY enhanced with additional experimental spectra
NEWS 4	MAR 31	CA/CAplus and CASREACT patent number format for U.S. applications updated
NEWS 5	MAR 31	LPCI now available as a replacement to LDPCI
NEWS 6	MAR 31	EMBASE, EMBAL, and LEMBASE reloaded with enhancements
NEWS 7	APR 04	STN AnaVist, Version 1, to be discontinued
NEWS 8	APR 15	WPIDS, WPINDEX, and WPIX enhanced with new predefined hit display formats
NEWS 9	APR 28	EMBASE Controlled Term thesaurus enhanced
NEWS 10	APR 28	IMSRESEARCH reloaded with enhancements
NEWS 11	MAY 30	INPAFAMDB now available on STN for patent family searching
NEWS 12	MAY 30	DGENE, PCTGEN, and USGENE enhanced with new homology sequence search option
NEWS 13	JUN 06	EPFULL enhanced with 260,000 English abstracts
NEWS 14	JUN 06	KOREAPAT updated with 41,000 documents
NEWS 15	JUN 13	USPATFULL and USPAT2 updated with 11-character patent numbers for U.S. applications
NEWS 16	JUN 19	CAS REGISTRY includes selected substances from web-based collections
NEWS 17	JUN 25	CA/CAplus and USPAT databases updated with IPC reclassification data
NEWS 18	JUN 30	AEROSPACE enhanced with more than 1 million U.S. patent records
NEWS 19	JUN 30	EMBASE, EMBAL, and LEMBASE updated with additional options to display authors and affiliated organizations
NEWS 20	JUN 30	STN on the Web enhanced with new STN AnaVist Assistant and BLAST plug-in
NEWS 21	JUN 30	STN AnaVist enhanced with database content from EPFULL
NEWS 22	JUL 28	CA/CAplus patent coverage enhanced
NEWS 23	JUL 28	EPFULL enhanced with additional legal status information from the epoline Register
NEWS 24	JUL 28	IFICDB, IFIPAT, and IFIUDB reloaded with enhancements
NEWS 25	JUL 28	STN Viewer performance improved
NEWS 26	AUG 01	INPADOCDB and INPAFAMDB coverage enhanced

NEWS EXPRESS JUNE 27 08 CURRENT WINDOWS VERSION IS V8.3,
AND CURRENT DISCOVER FILE IS DATED 23 JUNE 2008.

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FILE 'HOME' ENTERED AT 02:01:25 ON 11 AUG 2008

=> file medline, agricola, caba, caplus, biosis, biotechno
COST IN U.S. DOLLARS                                SINCE FILE      TOTAL
                                                         ENTRY    SESSION
FULL ESTIMATED COST                                       0.21       0.21

FILE 'MEDLINE' ENTERED AT 02:01:35 ON 11 AUG 2008

FILE 'AGRICOLA' ENTERED AT 02:01:35 ON 11 AUG 2008

FILE 'CABA' ENTERED AT 02:01:35 ON 11 AUG 2008
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FILE 'CAPLUS' ENTERED AT 02:01:35 ON 11 AUG 2008
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FILE 'BIOTECHNO' ENTERED AT 02:01:35 ON 11 AUG 2008
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=> s (frankard, v? or frankard v?)/au
L1         138 (FRANKARD, V? OR FRANKARD V?)/AU

=> s (cyclin(w)dependent(w)kinase(w)D) or cdkd or
(d(w)type(w)cyclin(w)dependent(w)kinase) or (cdk(w)activating(w)kinase(w)3)
L2          71 (CYCLIN(W) DEPENDENT(W) KINASE(W) D) OR CDKD OR (D(W) TYPE(W)
               CYCLIN(W) DEPENDENT(W) KINASE) OR (CDK(W) ACTIVATING(W) KINASE(W
               ) 3)

=> s l1 and l2
L3           2 L1 AND L2

=> duplicate remove l3
PROCESSING COMPLETED FOR L3
L4           2 DUPLICATE REMOVE L3 (0 DUPLICATES REMOVED)

=> d l4 1-2 bib

L4   ANSWER 1 OF 2  CAPLUS  COPYRIGHT 2008 ACS on STN
AN   2007:951653  CAPLUS
DN   147:465214
TI   Novel Plant-specific Cyclin-dependent Kinase Inhibitors Induced by Biotic
     and Abiotic Stresses
AU   Peres, Adrian; Churchman, Michelle L.; Hariharan, Srivaidehirani; Himanen,
```

Kristiina; Verkest, Aurine; Vandepoele, Klaas; Magyar, Zoltan; Hatzfeld, Yves; Van Der Schueren, Els; Beemster, Gerrit T. S.; Frankard, Valerie; Larkin, John C.; Inze, Dirk; De Veylder, Lieven

CS CropDesign N.V., Ghent, B-9052, Belg.

SO Journal of Biological Chemistry (2007), 282(35), 25588-25596
CODEN: JBCHA3; ISSN: 0021-9258

PB American Society for Biochemistry and Molecular Biology

DT Journal

LA English

RE.CNT 52 THERE ARE 52 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L4 ANSWER 2 OF 2 CAPLUS COPYRIGHT 2008 ACS on STN

AN 2005:984096 CAPLUS

DN 143:280477

TI Protein and cDNA sequences of a Arabidopsis thaliana protein (cyclin-dependent) kinase CDKD and use for increasing plant seed yield

IN Frankard, Valerie

PA Cropdesign N. V., Belg.

SO PCT Int. Appl., 39 pp.
CODEN: PIXXD2

DT Patent

LA English

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	WO 2005083094	A2	20050909	WO 2005-EP50874	20050301
	WO 2005083094	A3	20060209		
	W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW				
	RW: BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG				
	AU 2005217156	A1	20050909	AU 2005-217156	20050301
	CA 2557375	A1	20050909	CA 2005-2557375	20050301
	EP 1723242	A2	20061122	EP 2005-716849	20050301
	R: AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LI, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR				
	CN 1946848	A	20070411	CN 2005-80012292	20050301
	BR 2005008322	A	20070724	BR 2005-8322	20050301
	JP 2007525229	T	20070906	JP 2007-501277	20050301
	MX 2006PA09645	A	20070416	MX 2006-PA9645	20060824
	IN 2006CN03166	A	20070608	IN 2006-CN3166	20060831
	US 20070136894	A1	20070614	US 2006-591095	20060920
PRAI	EP 2004-100814	A	20040301		
	US 2004-550918P	P	20040305		
	WO 2005-EP50874	W	20050301		

=> d his

(FILE 'HOME' ENTERED AT 02:01:25 ON 11 AUG 2008)

FILE 'MEDLINE, AGRICOLA, CABA, CAPLUS, BIOSIS, BIOTECHNO' ENTERED AT 02:01:35 ON 11 AUG 2008

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L1          138 S (FRANKARD, V? OR FRANKARD V?)/AU
L2           71 S (CYCLIN(W)DEPENDENT(W)KINASE(W)D) OR CDKD OR (D(W)TYPE(W)CYCL
L3            2 S L1 AND L2
L4            2 DUPLICATE REMOVE L3 (0 DUPLICATES REMOVED)

=> s l2 not l1
L5          69 L2 NOT L1

=> s l5 and (plant or plants)
L6          25 L5 AND (PLANT OR PLANTS)

=> duplicate remove l6
DUPLICATE PREFERENCE IS 'MEDLINE, AGRICOLA, CABA, CAPLUS, BIOSIS, BIOTECHNO'
KEEP DUPLICATES FROM MORE THAN ONE FILE?  Y/(N):n
PROCESSING COMPLETED FOR L6
L7            8 DUPLICATE REMOVE L6 (17 DUPLICATES REMOVED)

=> d l7 1-8 ti

L7   ANSWER 1 OF 8  CAPLUS  COPYRIGHT 2008 ACS on STN
TI   Light-dependent regulation of cell division in Ostreococcus: evidence for
     a major transcriptional input

L7   ANSWER 2 OF 8     MEDLINE on STN                    DUPLICATE 1
TI   Diverse phosphoregulatory mechanisms controlling cyclin-dependent
     kinase-activating kinases in Arabidopsis.

L7   ANSWER 3 OF 8     MEDLINE on STN                    DUPLICATE 2
TI   Control of cell division and transcription by cyclin-dependent
     kinase-activating kinases in plants.

L7   ANSWER 4 OF 8  BIOSIS  COPYRIGHT (c) 2008 The Thomson Corporation  on STN
TI   Genome-wide analysis of core cell cycle genes in the unicellular green
     alga Ostreococcus tauri.

L7   ANSWER 5 OF 8  BIOSIS  COPYRIGHT (c) 2008 The Thomson Corporation  on STN
TI   Functional analysis of Arabidopsis CDK-activating kinases.

L7   ANSWER 6 OF 8     MEDLINE on STN                    DUPLICATE 3
TI   The plant-specific kinase CDKF;1 is involved in activating
     phosphorylation of cyclin-dependent kinase-activating kinases in
     Arabidopsis.

L7   ANSWER 7 OF 8  CAPLUS  COPYRIGHT 2008 ACS on STN
TI   Genome-wide analysis of core cell cycle genes in Arabidopsis

L7   ANSWER 8 OF 8     MEDLINE on STN                    DUPLICATE 4
TI   CDK-related protein kinases in plants.


=> d l7 1-8 bib

L7   ANSWER 1 OF 8  CAPLUS  COPYRIGHT 2008 ACS on STN
AN   2007:827616  CAPLUS
DN   147:317906
TI   Light-dependent regulation of cell division in Ostreococcus: evidence for
     a major transcriptional input
AU   Moulager, Mickael; Monnier, Annabelle; Jesson, Beline; Bouvet, Regis;
     Mosser, Jean; Schwartz, Christian; Garnier, Lionel; Corellou, Florence;
     Bouget, Francois-Yves
CS   Unite Mixte de Recherche 7628 Centre National de la Recherche
     Scientifique, Laboratoire Arago, Universite Paris VI, Banyuls sur Mer,
```

66650, Fr.
SO Plant Physiology (2007), 144(3), 1360-1369
CODEN: PLPHAY; ISSN: 0032-0889
PB American Society of Plant Biologists
DT Journal
LA English
RE.CNT 24 THERE ARE 24 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L7 ANSWER 2 OF 8 MEDLINE on STN DUPLICATE 1
AN 2006500107 MEDLINE
DN PubMed ID: 16856985
TI Diverse phosphoregulatory mechanisms controlling cyclin-dependent kinase-activating kinases in Arabidopsis.
AU Shimotohno Akie; Ohno Ryoko; Bisova Katerina; Sakaguchi Norihiro; Huang Jirong; Koncz Csaba; Uchimiya Hirofumi; Umeda Masaaki
CS Institute of Molecular and Cellular Biosciences, The University of Tokyo, Yayoi 1-1-1, Bunkyo-ku, Tokyo 113-0032, Japan.
SO The Plant journal : for cell and molecular biology, (2006 Sep) Vol. 47, No. 5, pp. 701-10. Electronic Publication: 2006-07-11.
Journal code: 9207397. ISSN: 0960-7412.
CY England: United Kingdom
DT Journal; Article; (JOURNAL ARTICLE)
(RESEARCH SUPPORT, NON-U.S. GOV'T)
LA English
FS Priority Journals
EM 200611
ED Entered STN: 23 Aug 2006
Last Updated on STN: 14 Nov 2006
Entered Medline: 13 Nov 2006

L7 ANSWER 3 OF 8 MEDLINE on STN DUPLICATE 2
AN 2005533280 MEDLINE
DN PubMed ID: 16024551
TI Control of cell division and transcription by cyclin-dependent kinase-activating kinases in plants.
AU Umeda Masaaki; Shimotohno Akie; Yamaguchi Masatoshi
CS Institute of Molecular and Cellular Biosciences, The University of Tokyo, Yayoi 1-1-1, Bunkyo-ku, Tokyo, 113-0032 Japan.. mumeda@iam.u-tokyo.ac.jp
SO Plant & cell physiology, (2005 Sep) Vol. 46, No. 9, pp. 1437-42.
Electronic Publication: 2005-07-15. Ref: 48
Journal code: 9430925. ISSN: 0032-0781.
CY Japan
DT Journal; Article; (JOURNAL ARTICLE)
(RESEARCH SUPPORT, NON-U.S. GOV'T)
General Review; (REVIEW)
LA English
FS Priority Journals
EM 200602
ED Entered STN: 7 Oct 2005
Last Updated on STN: 7 Feb 2006
Entered Medline: 6 Feb 2006

L7 ANSWER 4 OF 8 BIOSIS COPYRIGHT (c) 2008 The Thomson Corporation on STN
AN 2005:192429 BIOSIS
DN PREV200500193729
TI Genome-wide analysis of core cell cycle genes in the unicellular green alga Ostreococcus tauri.
AU Robbens, Steven; Khadaroo, Basheer; Camasses, Alain; Derelle, Evelyne; Ferraz, Conchita; Inze, Dirk; Van de Peer, Yves; Moreau, Herve [Reprint Author]
CS Lab Arago Modeles Biol Cellulaire and Evolut, Univ Paris 06, Banyuls sur

Mer, France
h.moreau@obs-banyuls.fr
SO Molecular Biology and Evolution, (March 2005) Vol. 22, No. 3, pp. 589-597. print.
CODEN: MBEVEO. ISSN: 0737-4038.
DT Article
LA English
ED Entered STN: 25 May 2005
Last Updated on STN: 25 May 2005

L7 ANSWER 5 OF 8 BIOSIS COPYRIGHT (c) 2008 The Thomson Corporation on STN
AN 2005:484191 BIOSIS
DN PREV200510288190
TI Functional analysis of Arabidopsis CDK-activating kinases.
AU Sakaguchi, Norihiro [Reprint Author]; Shimotohno, Akie; Uchimiya, Hirofumi; Sakaguchi, Kengo; Umeda, Masaaki
CS Sci Univ Tokyo, Dept Appl Biol Sci, Fac Sci and Technol, Tokyo 162, Japan
SO Plant and Cell Physiology, (2005) Vol. 46, No. Suppl. S, pp. S224.
Meeting Info.: 46th Annual Meeting of the Japanese-Society-of-Plant-Physiologists. Niigata, JAPAN. March 24 -26, 2005. Japanese Soc Plant Physiologists.
CODEN: PCPHA5. ISSN: 0032-0781.
DT Conference; (Meeting)
Conference; Abstract; (Meeting Abstract)
LA English
ED Entered STN: 16 Nov 2005
Last Updated on STN: 16 Nov 2005

L7 ANSWER 6 OF 8 MEDLINE on STN DUPLICATE 3
AN 2004551655 MEDLINE
DN PubMed ID: 15486101
TI The plant-specific kinase CDKF;1 is involved in activating phosphorylation of cyclin-dependent kinase-activating kinases in Arabidopsis.
AU Shimotohno Akie; Umeda-Hara Chikage; Bisova Katerina; Uchimiya Hirofumi; Umeda Masaaki
CS Institute of Molecular and Cellular Biosciences, University of Tokyo, Yayoi 1-1-1, Bunkyo-ku, Tokyo 113-0032, Japan.
SO The Plant cell, (2004 Nov) Vol. 16, No. 11, pp. 2954-66. Electronic Publication: 2004-10-14.
Journal code: 9208688. ISSN: 1040-4651.
CY United States
DT Journal; Article; (JOURNAL ARTICLE)
(RESEARCH SUPPORT, NON-U.S. GOV'T)
LA English
FS Priority Journals
OS GENBANK-AB051072
EM 200503
ED Entered STN: 4 Nov 2004
Last Updated on STN: 23 Mar 2005
Entered Medline: 22 Mar 2005

L7 ANSWER 7 OF 8 CAPLUS COPYRIGHT 2008 ACS on STN
AN 2002:351745 CAPLUS
DN 137:180526
TI Genome-wide analysis of core cell cycle genes in Arabidopsis
AU Vandepoele, Klaas; Raes, Jeroen; De Veylder, Lieven; Rouze, Pierre; Rombauts, Stephane; Inze, Dirk
CS Department of Plant Systems Biology, Flanders Interuniversity Institute for Biotechnology (VIB), Ghent University, Ghent, B-9000, Belg.
SO Plant Cell (2002), 14(4), 903-916
CODEN: PLCEEW; ISSN: 1040-4651

PB American Society of Plant Biologists
DT Journal
LA English
RE.CNT 59 THERE ARE 59 CITED REFERENCES AVAILABLE FOR THIS RECORD
            ALL CITATIONS AVAILABLE IN THE RE FORMAT

L7 ANSWER 8 OF 8 MEDLINE on STN DUPLICATE 4
AN 2001059738 MEDLINE
DN PubMed ID: 11089864
TI CDK-related protein kinases in plants.
AU Joubes J; Chevalier C; Dudits D; Heberle-Bors E; Inze D; Umeda M; Renaudin J P
CS Laboratory of Plant Physiology, National Institute for Agronomic Research INRA, Villenave d'Ornon, France.
SO Plant molecular biology, (2000 Aug) Vol. 43, No. 5-6, pp. 607-20. Ref: 83
    Journal code: 9106343. ISSN: 0167-4412.
CY Netherlands
DT Journal; Article; (JOURNAL ARTICLE)
    General Review; (REVIEW)
LA English
FS Priority Journals
EM 200012
ED Entered STN: 22 Mar 2001
    Last Updated on STN: 22 Mar 2001
    Entered Medline: 28 Dec 2000

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    (FILE 'HOME' ENTERED AT 02:01:25 ON 11 AUG 2008)

    FILE 'MEDLINE, AGRICOLA, CABA, CAPLUS, BIOSIS, BIOTECHNO' ENTERED AT 02:01:35 ON 11 AUG 2008
L1 138 S (FRANKARD, V? OR FRANKARD V?)/AU
L2 71 S (CYCLIN(W)DEPENDENT(W)KINASE(W)D) OR CDKD OR (D(W)TYPE(W)CYCL
L3 2 S L1 AND L2
L4 2 DUPLICATE REMOVE L3 (0 DUPLICATES REMOVED)
L5 69 S L2 NOT L1
L6 25 S L5 AND (PLANT OR PLANTS)
L7 8 DUPLICATE REMOVE L6 (17 DUPLICATES REMOVED)

=> s cak3at
L8 1 CAK3AT

=> d l8 ti

L8 ANSWER 1 OF 1 CAPLUS COPYRIGHT 2008 ACS on STN
TI Differential phosphorylation activities of CDK-activating kinases in Arabidopsis thaliana

=> d l8 bib

L8 ANSWER 1 OF 1 CAPLUS COPYRIGHT 2008 ACS on STN
AN 2003:32075 CAPLUS
DN 138:299760
TI Differential phosphorylation activities of CDK-activating kinases in Arabidopsis thaliana
AU Shimotohno, Akie; Matsubayashi, Satoko; Yamaguchi, Masatoshi; Uchimiya, Hirofumi; Umeda, Masaaki
CS Institute of Molecular and Cellular Biosciences, The University of Tokyo, Bunkyo-ku, Tokyo, 113-0032, Japan

```
SO   FEBS Letters (2003), 534(1-3), 69-74
     CODEN: FEBLAL; ISSN: 0014-5793
PB   Elsevier Science B.V.
DT   Journal
LA   English
RE.CNT  37    THERE ARE 37 CITED REFERENCES AVAILABLE FOR THIS RECORD
              ALL CITATIONS AVAILABLE IN THE RE FORMAT


=> d l8 kwic

L8   ANSWER 1 OF 1  CAPLUS  COPYRIGHT 2008 ACS on STN
ST   phosphorylation CDK activating kinase Arabidopsis thaliana CAK4At
     CAK3At CAK2At; protein sequence CDK activating kinase Arabidopsis
     thaliana
IT   372092-80-3, Protein kinase
     RL: BSU (Biological study, unclassified); PRP (Properties); BIOL
     (Biological study)
        (CAK2At, CAK3At, CAK4At; differential phosphorylation
        activities of CDK-activating kinases in Arabidopsis thaliana)


=> d his

     (FILE 'HOME' ENTERED AT 02:01:25 ON 11 AUG 2008)

     FILE 'MEDLINE, AGRICOLA, CABA, CAPLUS, BIOSIS, BIOTECHNO' ENTERED AT
     02:01:35 ON 11 AUG 2008
L1          138 S (FRANKARD, V? OR FRANKARD V?)/AU
L2           71 S (CYCLIN(W)DEPENDENT(W)KINASE(W)D) OR CDKD OR (D(W)TYPE(W)CYCL
L3            2 S L1 AND L2
L4            2 DUPLICATE REMOVE L3 (0 DUPLICATES REMOVED)
L5           69 S L2 NOT L1
L6           25 S L5 AND (PLANT OR PLANTS)
L7            8 DUPLICATE REMOVE L6 (17 DUPLICATES REMOVED)
L8            1 S CAK3AT

=> file uspatfull
COST IN U.S. DOLLARS                            SINCE FILE      TOTAL
                                                     ENTRY    SESSION
FULL ESTIMATED COST                                  59.87      60.08

FILE 'USPATFULL' ENTERED AT 02:07:14 ON 11 AUG 2008
CA INDEXING COPYRIGHT (C) 2008 AMERICAN CHEMICAL SOCIETY (ACS)

FILE COVERS 1971 TO PATENT PUBLICATION DATE: 7 Aug 2008 (20080807/PD)
FILE LAST UPDATED: 7 Aug 2008 (20080807/ED)
HIGHEST GRANTED PATENT NUMBER: US7409722
HIGHEST APPLICATION PUBLICATION NUMBER: US20080189819
CA INDEXING IS CURRENT THROUGH 7 Aug 2008 (20080807/UPCA)
ISSUE CLASS FIELDS (/INCL) CURRENT THROUGH: 7 Aug 2008 (20080807/PD)
REVISED CLASS FIELDS (/NCL) LAST RELOADED: Jun 2008
USPTO MANUAL OF CLASSIFICATIONS THESAURUS ISSUE DATE: Jun 2008

USPATFULL now includes complete International Patent Classification (IPC)
reclassification data for the second quarter of 2008.

=> s l1
            17 FRANKARD, V?/AU
            17 FRANKARD V?/AU
L9          17 (FRANKARD, V? OR FRANKARD V?)/AU
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            17 FRANKARD V?/AU
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        798527 DEPENDENT
         78359 KINASE
       2169919 D
             0 CYCLIN(W) DEPENDENT(W) KINASE(W) D
             5 CDKD
       2169919 D
       3300928 TYPE
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         78359 KINASE
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          4150 CDK
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         78359 KINASE
       5205913 3
             0 CDK(W) ACTIVATING(W) KINASE(W) 3
L10          1 L1 AND L2

=> d l10 bib

L10  ANSWER 1 OF 1  USPATFULL on STN
AN     2007:156672  USPATFULL
TI     Plants having increased yield and method for making the same
IN     Frankard, Valerie, Sint-Genesius-Rode, BELGIUM
PA     CropDesign N.V., Zwijnaarde, BELGIUM, B-9052 (non-U.S. corporation)
PI     US 20070136894      A1  20070614
AI     US 2005-591095      A1  20050301 (10)
       WO 2005-EP50874         20050301
                               20060920  PCT 371 date
PRAI   EP 2004-100814      20040301
       US 2004-550918P     20040305 (60)
DT     Utility
FS     APPLICATION
LREP   CONNOLLY BOVE LODGE & HUTZ, LLP, P O BOX 2207, WILMINGTON, DE, 19899, US
CLMN   Number of Claims: 24
ECL    Exemplary Claim: 1
DRWN   4 Drawing Page(s)
LN.CNT 1396
CAS INDEXING IS AVAILABLE FOR THIS PATENT.


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         78359 KINASE
       2169919 D
             0 CYCLIN(W) DEPENDENT(W) KINASE(W) D
             5 CDKD
       2169919 D
       3300928 TYPE
          9290 CYCLIN
        798527 DEPENDENT
         78359 KINASE
            11 D(W) TYPE(W) CYCLIN(W) DEPENDENT(W) KINASE
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         78359 KINASE
       5205913 3
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               ) 3)

=> s l11 and (plant or plants)
        291578 PLANT
        181326 PLANTS
L12          3 L11 AND (PLANT OR PLANTS)

=> s l12 not l10
L13          2 L12 NOT L10

=> d l13 1-2 ti

L13  ANSWER 1 OF 2  USPATFULL on STN
TI     Transgenic plants with enhanced agronomic traits

L13  ANSWER 2 OF 2  USPATFULL on STN
TI     Isolated nucleic acid molecules encoding P57KIP2


=> d l13 bib

L13  ANSWER 1 OF 2  USPATFULL on STN
AN     2008:169773  USPATFULL
TI     Transgenic plants with enhanced agronomic traits
IN     Abad, Mark Scott, Webster Grove, MO, UNITED STATES
PI     US 20080148432      A1  20080619
AI     US 2005-374300      A1  20051221 (11)
DT     Utility
FS     APPLICATION
LREP   MONSANTO COMPANY, 800 N. LINDBERGH BLVD., ATTENTION: GAIL P. WUELLNER,
       IP PARALEGAL, (E2NA), ST. LOUIS, MO, 63167, US
CLMN   Number of Claims: 11
ECL    Exemplary Claim: 1-22
DRWN   3 Drawing Page(s)
LN.CNT 5060
CAS INDEXING IS AVAILABLE FOR THIS PATENT.


=> d l13 kwic

L13  ANSWER 1 OF 2  USPATFULL on STN
TI     Transgenic plants with enhanced agronomic traits
AB     This invention provides transgenic plant cells with
       recombinant DNA for expression of proteins that are useful for imparting
       enhanced agronomic trait(s) to transgenic crop plants. This
       invention also provides transgenic plants and progeny seed
       comprising the transgenic plant cells where the plants
       are selected for having an enhanced trait selected from the group of
       traits consisting of enhanced water use efficiency, enhanced.  .  .
       enhanced nitrogen use efficiency, enhanced seed protein and enhanced
       seed oil. Also disclosed are methods for manufacturing transgenic seed
       and plants with enhanced traits.
SUMM   Disclosed herein are inventions in the field of plant genetics
       and developmental biology. More specifically, the present inventions
       provide plant cells with recombinant DNA for providing an
       enhanced trait in a transgenic plant, plants
       comprising such cells, seed and pollen derived from such plants
       , methods of making and using such cells, plants, seeds and
       pollen.
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SUMM Transgenic plants with improved agronomic traits such as yield, environmental stress tolerance, pest resistance, herbicide tolerance, improved seed compositions, and the like are desired by both farmers and consumers. Although considerable efforts in plant breeding have provided significant gains in desired traits, the ability to introduce specific DNA into plant genomes provides further opportunities for generation of plants with improved and/or unique traits. Merely introducing recombinant DNA into a plant genome doesn't always produce a transgenic plant with an enhanced agronomic trait. Methods to select individual transgenic events from a population are required to identify those transgenic. . .

SUMM This invention employs recombinant DNA for expression of proteins that are useful for imparting enhanced agronomic traits to the transgenic plants. Recombinant DNA in this invention is provided in a construct comprising a promoter that is functional in plant cells and that is operably linked to DNA that encodes a protein having at least one amino acid domain in. . . of Pfam domain names as identified in Table 12. In more specific embodiments of the invention the protein expressed in plant cells has an amino acid sequence with at least 90% identity to a consensus amino acid sequence in the group. . . 1482 and homologs thereof listed in Table 2. In even more specific embodiments of the invention the protein expressed in plant cells is a protein selected from the group of proteins identified in Table 1.

SUMM Other aspects of the invention are specifically directed to transgenic plant cells comprising the recombinant DNA of the invention, transgenic plants comprising a plurality of such plant cells, progeny transgenic seed, embryo and transgenic pollen from such plants. Such plant cells are selected from a population of transgenic plants regenerated from plant cells transformed with recombinant DNA and that express the protein by screening transgenic plants in the population for an enhanced trait as compared to control plants that do not have said recombinant DNA, where the enhanced trait is selected from group of enhanced traits consisting of. . .

SUMM In yet another aspect of the invention the plant cells, plants, seeds, embryo and pollen further comprise DNA expressing a protein that provides tolerance from exposure to an herbicide applied at levels that are lethal to a wild type of said plant cell. Such tolerance is especially useful not only as a advantageous trait in such plants but is also useful in a selection step in the methods of the invention. In aspects of the invention the. . .

SUMM Yet other aspects of the invention provide transgenic plants which are homozygous for the recombinant DNA and transgenic seed of the invention from corn, soybean, cotton, canola, alfalfa, wheat or rice plants. In other important embodiments for practice of various aspects of the invention in Argentina the recombinant DNA is provided in plant cells derived from corn lines that that are and maintain resistance to the Mal de Rio Cuarto virus or the. . .

SUMM This invention also provides methods for manufacturing non-natural, transgenic seed that can be used to produce a crop of transgenic plants with an enhanced trait resulting from expression of stably-integrated, recombinant DNA for expressing a protein having at least one domain. . . in the group of Pfam names identified in Table 12. More specifically the method comprises (a) screening a population of plants for an enhanced trait and a recombinant DNA, where individual plants in the population can exhibit the trait at a level less than, essentially the same as or greater than the level that the trait is exhibited in control plants which do not express the recombinant DNA, (b) selecting from the population one or more plants that exhibit the trait at a level greater than the level that said trait is exhibited in control plants, (c) verifying

that the recombinant DNA is stably integrated in said selected plants, (d) analyzing tissue of a selected plant to determine the production of a protein having the function of a protein encoded by nucleotides in a sequence of one of SEQ ID NO: 1-741; and (e) collecting seed from a selected plant. In one aspect of the invention the plants in the population further comprise DNA expressing a protein that provides tolerance to exposure to an herbicide applied at levels that are lethal to wild type plant cells and the selecting is effected by treating the population with the herbicide, e.g. a glyphosate, dicamba, or glufosinate compound. In another aspect of the invention the plants are selected by identifying plants with the enhanced trait. The methods are especially useful for manufacturing corn, soybean, cotton, alfalfa, wheat or rice seed.

SUMM . . . the invention provides a method of producing hybrid corn seed comprising acquiring hybrid corn seed from a herbicide tolerant corn plant which also has stably-integrated, recombinant DNA comprising a promoter that is (a) functional in plant cells and (b) is operably linked to DNA that encodes a protein having at least one domain of amino acids. . . by a Pfam name in the group of Pfam names identified in Table 12. The methods further comprise producing corn plants from said hybrid corn seed, wherein a fraction of the plants produced from said hybrid corn seed is homozygous for said recombinant DNA, a fraction of the plants produced from said hybrid corn seed is hemizygous for said recombinant DNA, and a fraction of the plants produced from said hybrid corn seed has none of said recombinant DNA; selecting corn plants which are homozygous and hemizygous for said recombinant DNA by treating with an herbicide; collecting seed from herbicide-treated-surviving corn plants and planting said seed to produce further progeny corn plants; repeating the selecting and collecting steps at least once to produce an inbred corn line; and crossing the inbred corn. . .

SUMM Another aspect of the invention provides a method of selecting a plant comprising plant cells of the invention by using an immunoreactive antibody to detect the presence of protein expressed by recombinant DNA in seed or plant tissue. Yet another aspect of the invention provides anti-counterfeit milled seed having, as an indication of origin, a plant cells of this invention.

SUMM Still other aspects of this invention relate to transgenic plants with enhanced water use efficiency or enhanced nitrogen use efficiency. For instance, this invention provides methods of growing a corn, cotton or soybean crop without irrigation water comprising planting seed having plant cells of the invention which are selected for enhanced water use efficiency. Alternatively methods comprise applying reduced irrigation water, e.g.. . . invention also provides methods of growing a corn, cotton or soybean crop without added nitrogen fertilizer comprising planting seed having plant cells of the invention which are selected for enhanced nitrogen use efficiency.

DETD As used herein a "plant cell" means a plant cell that is transformed with stably-integrated, non-natural, recombinant DNA, e.g. by Agrobacterium-mediated transformation or by baombardment using microparticles coated with recombinant DNA or other means. A plant cell of this invention can be an originally-transformed plant cell that exists as a microorganism or as a progeny plant cell that is regenerated into differentiated tissue, e.g. into a transgenic plant with stably-integrated, non-natural recombinant DNA, or seed or pollen derived from a progeny transgenic plant.

DETD As used herein a "transgenic plant" means a plant whose genome has been altered by the stable integration of recombinant DNA. A transgenic plant includes a plant regenerated

from an originally-transformed plant cell and progeny transgenic plants from later generations or crosses of a transformed plant.

DETD . . . function, e.g. proteins that belong to the same Pfam protein family and that provide a common enhanced trait in transgenic plants of this invention. Homologs are expressed by homologous genes. Homologous genes include naturally occurring alleles and artificially-created variants. Degeneracy of. . . identity over the full length of a protein identified as being associated with imparting an enhanced trait when expressed in plant cells. Homologs include proteins with an amino acid sequence that has at least 90% identity to a consensus amino acid. . .

DETD . . . lysine-arginine, alanine-valine, aspartic acid-glutamic acid, and asparagine-glutamine. A further aspect of the homologs encoded by DNA useful in the transgenic plants of the invention are those proteins that differ from a disclosed protein as the result of deletion or insertion of. . .

DETD . . . be low. Once one DNA is identified as encoding a protein which imparts an enhanced trait when expressed in transgenic plants, other DNA encoding proteins in the same protein family are identified by querying the amino acid sequence of protein encoded. . . in the protein family and have cognate DNA that is useful in constructing recombinant DNA for the use in the plant cells of this invention. Hidden Markov Model databases for use with HMMER software in identifying DNA expressing protein in a common Pfam for recombinant DNA in the plant cells of this invention are also included in the appended computer listing. The HMMER software and Pfam databases are version. . . the gathering cutoff disclosed in Table 12 by Pfam analysis disclosed herein can be used in recombinant DNA of the plant cells of this invention, e.g. for selecting transgenic plants having enhanced agronomic traits. The relevant Pfams for use in this invention, as more specifically disclosed below, are bZIP.sub.--1, bZIP.sub.--2,. . .

DETD As used herein "promoter" means regulatory DNA for initializing transcription. A "plant promoter" is a promoter capable of initiating transcription in plant cells whether or not its origin is a plant cell, e.g. is it well known that Agrobacterium promoters are functional in plant cells. Thus, plant promoters include promoter DNA obtained from plants, plant viruses and bacteria such as Agrobacterium and Bradyrhizobium bacteria. Examples of promoters under developmental control include promoters that preferentially initiate. . .

DETD As used herein "expressed" means produced, e.g. a protein is expressed in a plant cell when its cognate DNA is transcribed to mRNA that is translated to the protein.

DETD As used herein a "control plant" means a plant that does not contain the recombinant DNA that expressed a protein that impart an enhanced trait. A control plant is to identify and select a transgenic plant that has an enhance trait. A suitable control plant can be a non-transgenic plant of the parental line used to generate a transgenic plant, i.e. devoid of recombinant DNA. A suitable control plant may in some cases be a progeny of a hemizygous transgenic plant line that is does not contain the recombinant DNA, known as a negative segregant.

DETD As used herein an "enhanced trait" means a characteristic of a transgenic plant that includes, but is not limited to, an enhance agronomic trait characterized by enhanced plant morphology, physiology, growth and development, yield, nutritional enhancement, disease or pest resistance, or environmental or chemical tolerance. In more specific. . . infestation, nematode infestation,

cold temperature exposure, heat exposure, osmotic stress, reduced nitrogen nutrient availability, reduced phosphorus nutrient availability and high plant density. "Yield" can be affected by many properties including without limitation, plant height, pod number, pod position on the plant, number of internodes, incidence of pod shatter, grain size, efficiency of nodulation and nitrogen fixation, efficiency of nutrient assimilation, resistance to biotic and abiotic stress, carbon assimilation, plant architecture, resistance to lodging, percent seed germination, seedling vigor, and juvenile traits. Yield can also affected by efficiency of germination. . .

DETD Increased yield of a transgenic plant of the present invention can be measured in a number of ways, including test weight, seed number per plant, seed weight, seed number per unit area (i.e. seeds, or weight of seeds, per acre), bushels per acre, tonnes per. . . drought, salt, and attack by pests or pathogens. Recombinant DNA used in this invention can also be used to provide plants having improved growth and development, and ultimately increased yield, as the result of modified expression of plant growth regulators or modification of cell cycle or photosynthesis pathways. Also of interest is the generation of transgenic plants that demonstrate enhanced yield with respect to a seed component that may or may not correspond to an increase in overall plant yield. Such properties include enhancements in seed oil, seed molecules such as tocopherol, protein and starch, or oil particular oil. . .

DETD . . . more distal dimerization domain (the K-box) and a C-terminal domain that is usually involved in interactions with other proteins. In plants the region between the MADS box and the K-box has been shown to be important for DNA binding in some. . .

DETD Numerous promoters that are active in plant cells have been described in the literature. These include promoters present in plant genomes as well as promoters from other sources, including nopaline synthase (NOS) promoter and octopine synthase (OCS) promoters carried on. . . actin promoter, U.S. Patent Application Publication 2002/0192813A1, which discloses 5', 3' and intron elements useful in the design of effective plant expression vectors, U.S. patent application Ser. No. 09/757,089, which discloses a maize chloroplast aldolase promoter, U.S. patent application Ser. No.. . . maize nicotianamine synthase promoter, all of which are incorporated herein by reference. These and numerous other promoters that function in plant cells are known to those skilled in the art and available for use in recombinant polynucleotides of the present invention to provide for expression of desired genes in transgenic plant cells.

DETD In other aspects of the invention, preferential expression in plant green tissues is desired. Promoters of interest for such uses include those from genes such as Arabidopsis thaliana ribulose-1,5-bisphosphate carboxylase (Rubisco) small subunit (Fischhoff et al. (1992) Plant Mol Biol. 20:81-93), aldolase and pyruvate orthophosphate dikinase (PPDK) (Taniguchi et al. (2000) Plant Cell Physiol. 41(11):42-48).

DETD In other aspects of the invention, sufficient expression in plant seed tissues is desired to effect improvements in seed composition. Exemplary promoters for use for seed composition modification include promoters. . . 1 (Belanger et al (1991) Genetics 129:863-872), glutelin 1 (Russell (1997) supra), and peroxiredoxin antioxidant (Per1) (Stacy et al. (1996) Plant Mol Biol. 31(6): 1205-1216).

DETD . . . 3, ocs 3', tr7 3', for example disclosed in U.S. Pat. No. 6,090,627, incorporated herein by reference; 3' elements from plant genes such as wheat (Triticum aesevitum) heat shock protein 17 (Hsp17 3'), a wheat ubiquitin gene, a wheat

fructose-1,6-biphosphatase gene,. . . and the pea (Pisum sativum) ribulose biphosphate carboxylase gene (rbs 3), and 3' elements from the genes within the host plant.

DETD Constructs and vectors may also include a transit peptide for targeting of a gene target to a plant organelle, particularly to a chloroplast, leucoplast or other plastid organelle. For descriptions of the use of chloroplast transit peptides see. . .

DETD Transgenic plants comprising or derived from plant cells of this invention transformed with recombinant DNA can be further enhanced with stacked traits, e.g. a crop plant having an enhanced trait resulting from expression of DNA disclosed herein in combination with herbicide and/or pest resistance traits. For. . . a gene from Bacillus thuringensis to provide resistance against lepidopteran, coliopteran, homopteran, hemiopteran, and other insects. Herbicides for which transgenic plant tolerance has been demonstrated and the method of the present invention can be applied include, but are not limited to,. . . Pat. No. 4,810,648 for imparting bromoxynil tolerance; a polynucleotide molecule encoding phytoene desaturase (crtI) described in Misawa et al, (1993) Plant J 4:833-840 and Misawa et al, (1994) Plant J 6:481-489 for norflurazon tolerance; a polynucleotide molecule encoding acetohydroxyacid synthase (AHAS, aka ALS) described in Sathasiivan et al. (1990). . .

DETD Plant Cell Transformation Methods

DETD Numerous methods for transforming plant cells with recombinant DNA are known in the art and may be used in the present invention. Two commonly used methods for plant transformation are Agrobacterium-mediated transformation and microprojectile bombardment. Microprojectile bombardment methods are illustrated in U.S. Pat. Nos. 5,015,580 (soybean); 5,550,318 (corn);. . . (cotton); 5,824,877 (soybean); 5,591,616 (corn); and 6,384,301 (soybean), all of which are incorporated herein by reference. For Agrobacterium tumefaciens based plant transformation system, additional elements present on transformation constructs will include T-DNA left and right border sequences to facilitate incorporation of the recombinant polynucleotide into the plant genome.

DETD . . . general it is useful to introduce recombinant DNA randomly, i.e. at a non-specific location, in the genome of a target plant line. In special cases it may be useful to target recombinant DNA insertion in order to achieve site-specific integration, for example to replace an existing gene in the genome, to use an existing promoter in the plant genome, or to insert a recombinant polynucleotide at a predetermined site known to be active for gene expression. Several site. . .

DETD . . . gametic cells such as microspores, pollen, sperm and egg cells. It is contemplated that any cell from which a fertile plant may be regenerated is useful as a recipient cell. Callus may be initiated from tissue sources including, but not limited. . . capable of proliferating as callus are also recipient cells for genetic transformation. Practical transformation methods and materials for making transgenic plants of this invention, for example various media and recipient target cells, transformation of immature embryo cells and subsequent regeneration of fertile transgenic plants are disclosed in U.S. Pat. Nos. 6,194,636 and 6,232,526, which are incorporated herein by reference.

DETD The seeds of transgenic plants can be harvested from fertile transgenic plants and be used to grow progeny generations of transformed plants of this invention including hybrid plants line for selection of plants having an enhanced trait. In addition to direct transformation of a plant with a recombinant DNA, transgenic plants can be prepared by crossing a first plant having a recombinant DNA with a second

plant lacking the DNA. For example, recombinant DNA can be introduced into first plant line that is amenable to transformation to produce a transgenic plant which can be crossed with a second plant line to introgress the recombinant DNA into the second plant line. A transgenic plant with recombinant DNA providing an enhanced trait, e.g. enhanced yield, can be crossed with transgenic plant line having other recombinant DNA that confers another trait, for example herbicide resistance or pest resistance, to produce progeny plants having recombinant DNA that confers both traits. Typically, in such breeding for combining traits the transgenic plant donating the additional trait is a male line and the transgenic plant carrying the base traits is the female line. The progeny of this cross will segregate such that some of the plants will carry the DNA for both parental traits and some will carry DNA for one parental trait; such plants can be identified by markers associated with parental recombinant DNA, e.g. marker identification by analysis for recombinant DNA or, in. . . agent such as a herbicide for use with a herbicide tolerance marker, or by selection for the enhanced trait. Progeny plants carrying DNA for both parental traits can be crossed back into the female parent line multiple times, for example usually 6 to 8 generations, to produce a progeny plant with substantially the same genotype as one original transgenic parental line but for the recombinant DNA of the other transgenic. . .

DETD In the practice of transformation DNA is typically introduced into only a small percentage of target plant cells in any one transformation experiment. Marker genes are used to provide an efficient system for identification of those cells. . . markers which confer resistance to a selective agent, such as an antibiotic or herbicide. Any of the herbicides to which plants of this invention may be resistant are useful agents for selective markers. Potentially transformed cells are exposed to the selective. . .

DETD Plant cells that survive exposure to the selective agent, or plant cells that have been scored positive in a screening assay, may be cultured in regeneration media and allowed to mature into plants. Developing plantlets regenerated from transformed plant cells can be transferred to plant growth mix, and hardened off, for example, in an environmentally controlled chamber at about 85% relative humidity, 600 ppm CO.sub.2, and 25-250 microeinsteins m.sup.-2 s.sup.-1 of light, prior to transfer to a greenhouse or growth chamber for maturation. Plants are regenerated from about 6 weeks to 10 months after a transformant is identified, depending on the initial tissue. Plants may be pollinated using conventional plant breeding methods known to those of skill in the art and seed produced, for example self-pollination is commonly used with transgenic corn. The regenerated transformed plant or its progeny seed or plants can be tested for expression of the recombinant DNA and selected for the presence of enhanced agronomic trait.

DETD Transgenic Plants and Seeds

DETD Transgenic plants derived from the plant cells of this invention are grown to generate transgenic plants having an enhanced trait as compared to a control plant and produce transgenic seed and haploid pollen of this invention. Such plants with enhanced traits are identified by selection of transformed plants or progeny seed for the enhanced trait. For efficiency a selection method is designed to evaluate multiple transgenic plants (events) comprising the recombinant DNA, for example multiple plants from 2 to 20 or more transgenic events. Transgenic plants grown from transgenic seed provided herein demonstrate improved agronomic traits that contribute to increased yield or other trait that provides increased plant

value, including, for example, improved seed quality. Of particular interest are plants having enhanced water use efficiency, enhanced cold tolerance, increased yield, enhanced nitrogen use efficiency, enhanced seed protein and enhanced seed. . .

DETD Table 1 provides a list of protein encoding DNA ("genes") that are useful as recombinant DNA for production of transgenic plants with enhanced agronomic trait, the elements of Table 1 are described by reference to:

DETD . . . number in Table 4 of base vectors used for construction of the transformation vectors of the recombinant DNA. Construction of plant transformation constructs is illustrated in Example 1. "PROTEIN NAME" which is a common name for protein encoded by the recombinant. . .

DETD . . . like 1 sequence

1119	378	PHE0002846_2981	1	Zea Mays trehalose-6-phosphate phosphatase
1120	379	PHE0002864_2999	1	soy CDKA 8
1121	380	PHE0002869_3004	1	corn CDKD 12
1122	381	PHE0002875_3010	1	Corn homolog to Arabidopsis unknown expressed protein
1123	382	PHE0002889_3024	1	soy dsPTP 3
1124	383	PHE0002896_3031	1. . .	

DETD . . . corn AfMONFEED000499 putative indole-3-acetic acid-regulated protein

1482	741	PHE0004008_4594	4	corn AtMONFEED000474 serine protease-like protein

Selection Methods for Transgenic Plants with Enhanced Agronomic Trait

DETD Within a population of transgenic plants regenerated from plant cells transformed with the recombinant DNA many plants that survive to fertile transgenic plants that produce seeds and progeny plants will not exhibit an enhanced agronomic trait. Selection from the population is necessary to identify one or more transgenic plant cells that can provide plants with the enhanced trait. Transgenic plants having enhanced traits are selected from populations of plants regenerated or derived from plant cells transformed as described herein by evaluating the plants in a variety of assays to detect an enhanced trait, e.g. enhanced water use efficiency, enhanced cold tolerance, increased yield,. . . surrogate trait. Such analyses can be directed to detecting changes in the chemical composition, biomass, physiological properties, morphology of the plant. Changes in chemical compositions such as nutritional composition of grain can be detected by analysis of the seed composition and. . . acids, oil, free fatty acids, starch or tocopherols. Changes in biomass characteristics can be made on greenhouse or field grown plants and can include plant height, stem diameter, root and shoot dry weights; and, for corn plants, ear length and diameter. Changes in physiological properties can be identified by evaluating responses to stress conditions, for example assays. . . stress conditions such as water deficit, nitrogen deficiency, cold growing conditions, pathogen or insect attack or light deficiency, or increased plant density. Changes in morphology can be measured by visual observation of tendency of a transformed plant with an enhanced agronomic trait to also appear to be a normal plant as compared to changes toward bushy, taller, thicker, narrower leaves, striped leaves, knotted trait, chlorosis, albino, anthocyanin production, or altered. . . include days to pollen shed, days to silking, leaf extension rate, chlorophyll content, leaf temperature, stand, seedling vigor, internode length, plant height, leaf

number, leaf area, tillering, brace roots, stay green, stalk lodging, root lodging, plant health, barreness/prolificacy, green snap, and pest resistance. In addition, phenotypic characteristics of harvested grain may be evaluated, including number of. . . rows of kernels on the ear, kernel abortion, kernel weight, kernel size, kernel density and physical grain quality. Although the plant cells and methods of this invention can be applied to any plant cell, plant, seed or pollen, e.g. any fruit, vegetable, grass, tree or ornamental plant, the various aspects of the invention are preferably applied to corn, soybean, cotton, canola, alfalfa, wheat and rice plants. In many cases the invention is applied to corn plants that are inherently resistant to disease from the Mal de Rio Cuarto virus or the Puccina sorghi fungus or both.

DETD Plant Expression Constructs

DETD A. Plant Expression Constructs for Corn Transformation

DETD This example illustrates the construction of plasmids for transferring recombinant DNA into plant cells which can be regenerated into transgenic plants of this invention.

DETD A base plant transformation vector pMON65154, as set forth in SEQ ID NO: 52768 was fabricated for use in preparing recombinant DNA for transformation into corn tissue using GATEWAY.TM. Destination plant expression vector systems (available from Invitrogen Life Technologies, Carlsbad, Calif.). With reference to the elements described in Table 3 below,. . . proteinase inhibitor II (pinII) gene. Once recombinant DNA has been inserted into the insertion site, the plasmid is useful for plant transformation, e.g. by microprojectile bombardment.

DETD

TABLE 3

FUNCTION	ELEMENT	REFERENCE
Plant gene of interest expression cassette	Rice actin 1 promoter	U.S. Pat. No. 5,641,876
	Rice actin 1 exon 1, intron 1	U.S.. . . .TM. Cloning Technology Instruction Manual
	ccdA, ccdB genes	GATEWAY .TM. Cloning Technology Instruction Manual
	attR2	GATEWAY .TM. Cloning Technology Instruction Manual
Plant gene of interest expression cassette	Potato pinII 3' region	An et al. (1989) Plant Cell 1: 115-122
Plant selectable marker expression cassette	CaMV 35S promoter	U.S. Pat. No. 5,858,742
	nptII selectable marker	U.S. Pat. No. 5,858,742
	nos 3' region	U.S.. . .

DETD A similar base vector plasmid pMON72472 (SEQ ID NO: 52769) was constructed for use in Agrobacterium-mediated methods of plant transformation similar to pMON65154 except (a) the 5' regulatory DNA in the template recombinant DNA expression cassette was a rice. . .

DETD . . . resistance	CR-Ec.aadA-SPC/STR	
Repressor of primers from the ColE1 plasmid	CR-Ec.rop	
Origin of replication	OR-Ec.oriV-RK2	
Agro transformation	B-ARGtu.left border	Barker, R. F. et al (1983) Plant Mol Biol 2: 335-350

Plant selectable marker expression cassette	Promoter with intron and 5'UTR of Arabidopsis act 7 gene (AtAct7)	McDowell et al. (1996) Plant Physiol. 111: 699-711.	
	5' UTR of Arabidopsis act 7 gene		
	Intron in 5'UTR of AtAct7		
	Transit peptide region. . . dicot preferred codon usage		
	A 3' UTR of the nopaline synthase gene of Agrobacterium tumefaciens Ti plasmid		U.S. Pat. No. 5,858,742
Plant gene of interest expression cassette	Promoter for 35S RNA from CaMV containing a duplication of the -90. . .		U.S. Pat. No. 5,322,938

DETD This example illustrates plant cell transformation methods useful in producing transgenic corn plant cells, plants, seeds and pollen of this invention and the production and identification of transgenic corn plants and seed with an enhanced trait, i.e. enhanced water use efficiency, enhanced cold tolerance, increased yield, enhanced nitrogen use efficiency,. . . prepared by cloning DNA identified in Table 1 in the identified base vectors for use in corn transformation of corn plant cells to produce transgenic corn plants and progeny plants, seed and pollen.

DETD For Agrobacterium-mediated transformation of corn embryo cells corn plants of a readily transformable line (designated LH59) is grown in the greenhouse and ears harvested when the embryos are 1.5. . . cells are inoculated with Agrobacterium shortly after excision, and incubated at room temperature with Agrobacterium for 5-20 minutes. Immature embryo plant cells are then co-cultured with Agrobacterium for 1 to 3 days at 23° C. in the dark. Co-cultured embryos are. . . develop. Embryogenic callus is transferred to culture medium containing 100 mg/L paromomycin and subcultured at about two week intervals. Transformed plant cells are recovered 6 to 8 weeks after initiation of selection.

DETD . . . microprojectile bombardment, tissue is cultured in the dark at 27 degrees C. Additional transformation methods and materials for making transgenic plants of this invention, for example, various media and recipient target cells, transformation of immature embryos and subsequence regeneration of fertile transgenic plants are disclosed in U.S. Pat. Nos. 6,194,636 and 6,232,526 and U.S. patent application Ser. No. 09/757,089, which are incorporated herein. . .

DETD To regenerate transgenic corn plants a callus of transgenic plant cells resulting from transformation is placed on media to initiate shoot development in plantlets which are transferred to potting soil. . . in a growth chamber at 26 degrees C. followed by a mist bench before transplanting to 5 inch pots where plants are grown to maturity. The regenerated plants are self fertilized and seed is harvested for use in one or more methods to select seed, seedlings or progeny second generation transgenic plants (R2 plants) or hybrids, e.g. by selecting transgenic plants exhibiting an enhanced trait as compared to a control plant.

DETD Transgenic corn plant cells are transformed with recombinant DNA from each of the genes identified in Table 1. Progeny transgenic plants and seed of the transformed plant cells are screened for enhanced water use efficiency, enhanced cold tolerance,

increased yield, enhanced nitrogen use efficiency, enhanced seed protein. . .

DETD This example illustrates plant transformation useful in producing the transgenic soybean plants of this invention and the production and identification of transgenic seed for transgenic soybean having enhanced water use efficiency, enhanced. . .

DETD . . . Soybean explants and induced Agrobacterium cells from a strain containing plasmid DNA with the gene of interest cassette and a plant selectable marker cassette are mixed no later than 14 hours from the time of initiation of seed germination and wounded. . . for an additional two weeks. Roots from any shoots that produce roots off selection are tested for expression of the plant selectable marker before they are transferred to the greenhouse and potted in soil. Additionally, a DNA construct can be transferred into the genome of a soybean cell by particle bombardment and the cell regenerated into a fertile soybean plant as described in U.S. Pat. No. 5,015,580, herein incorporated by reference.

DETD Transgenic soybean plant cells are transformed with recombinant DNA from each of the genes identified in Table 1. Progeny transgenic plants and seed of the transformed plant cells are screened for enhanced water use efficiency, enhanced cold tolerance, increased yield, enhanced nitrogen use efficiency, enhanced seed protein. . .

DETD . . . of homologs of proteins encoded by the DNA identified in Table 1 which is used to provide transgenic seed and plants having enhanced agronomic traits. From the sequence of the homologs, homologous DNA sequence can be identified for preparing additional transgenic seeds and plants of this invention with enhanced agronomic traits.

DETD Selection of Transgenic Plants with Enhanced Agronomic Trait(s)

DETD This example illustrates identification of plant cells of the invention by screening derived plants and seeds for enhanced trait. Transgenic corn seed and plants with recombinant DNA identified in Table 1 were prepared by plant cells transformed with DNA that was stably integrated into the genome of the corn cell. The transgenic seed, plantlets and progeny plants were selected using the methods that measure Transgenic corn plant cells were transformed with recombinant DNA from each of the genes identified in Table 1. Progeny transgenic plants and seed of the transformed plant cells were screened for enhanced water use efficiency, enhanced cold tolerance, increased yield, enhanced nitrogen use efficiency, enhanced seed protein and enhanced seed oil as compared to control plants.

DETD The physiological efficacy of transgenic corn plants (tested as hybrids) can be tested for nitrogen use efficiency (NUE) traits in a high-throughput nitrogen (N) selection method. The. . . are due to the transgene. Raw data were analyzed by SAS software. Results shown herein are the comparison of transgenic plants relative to the wildtype controls.

DETD Plants are allowed to grow for 28 days under the low N run or for 23 days under the high N. . .

DETD (c) Harvest Measurements and Data Collection--After 28 days of plant growth for low N runs and 23 days of plant growth for high N runs, the following measurements are taken (phenocodes in parentheses): total shoot fresh mass (g) (SFM) measured. . . (LDM) measured by Sartorius electronic balance. Raw data were analyzed by SAS software. Results shown are the comparison of transgenic plants relative to the wildtype controls.

DETD . . . readings of corn leaves are affected by the part of the leaf and the position of the leaf on the plant that is sampled, SPAD meter readings were done on leaf six of the plants. Three measurements per leaf were taken, of which the first reading was taken

from a point one-half the distance between. . .

DETD Level I. Transgenic plants provided by the present invention are planted in field without any nitrogen source being applied. Transgenic plants and control plants are grouped by genotype and construct with controls arranged randomly within genotype blocks. Each type of transgenic plants are tested by 3 replications and across 5 locations. Nitrogen levels in the fields are analyzed in early April pre-planting. . .

DETD Level II. Transgenic plants provided by the present invention are planted in field with three levels of nitrogen (N) fertilizer being applied, i.e. low. . . to the 0 N treatment the soil should still be disturbed in the same fashion as the treated area. Transgenic plants and control plants are grouped by genotype and construct with controls arranged randomly within genotype blocks. Each type of transgenic plants is tested by 3 replications and across 4 locations. Nitrogen levels in the fields are analyzed in early April pre-planting. . .

DETD Many transgenic plants of this invention exhibit improved yield as compared to a control plant. Improved yield can result from enhanced seed sink potential, i.e. the number and size of endosperm cells or kernels and/or. . .

DETD . . . has been increasing at a rate of 2.1 bushels/acre/year, but the planting density has increased at a rate of 250 plants /acre/year. A characteristic of modern hybrid corn is the ability of these varieties to be planted at high density. Many studies. . .

DETD Effective yield selection of enhanced yielding transgenic corn events uses hybrid progeny of the transgenic event over multiple locations with plants grown under optimal production management practices, and maximum pest control. A useful target for improved yield is a 5% to 10% increase in yield as compared to yield produced by plants grown from seed for a control plant. Selection methods may be applied in multiple and diverse geographic locations, for example up to 16 or more locations, over. . . seasons, for example at least two planting seasons to statistically distinguish yield improvement from natural environmental effects. It is to plant multiple transgenic plants, positive and negative control plants, and pollinator plants in standard plots, for example 2 row plots, 20 feet long by 5 feet wide with 30 inches distance between. . . every two plots to allow open pollination when using male sterile transgenic events. A useful planting density is about 30,000 plants/acre. High planting density is greater than 30,000 plants/acre, preferably about 40,000 plants /acre, more preferably about 42,000 plants/acre, most preferably about 45,000 plants/acre. Surrogate indicators for yield improvement include source capacity (biomass), source output (sucrose and photosynthesis), sink components (kernel size, ear size,. . . (light response, height, density tolerance), maturity, early flowering trait and physiological responses to high density planting, for example at 45,000 plants per acre, for example as illustrated in Table 10 and 11.

DETD . . . 8

Timing	Evaluation	Description	comments
V2-3	Early stand	Can be taken any time after germination and prior to removal of any plants.	
Pollen shed	GDU to 50% shed	GDU to 50% plants shedding 50% tassel.	
Silking	GDU to 50% silk	GDU to 50% plants showing silks.	
Maturity	Plant height	Height from soil surface to	10

plants per plot - Yield

flag leaf attachment (inches). team assistance

Maturity Ear height Height from soil surface to 10 plants per plot - Yield

primary ear attachment node. team assistance

Maturity Leaves above ear visual scores: erect, size, rolling

Maturity Tassel size. . .

DETD . . . is measured with actinic light 1500 (with 10% blue light) micromol m.sup.-2 s.sup.-1, 28° C., CO.sub.2 levels 450 ppm. Ten plants are measured in each event. There were 2 readings for each plant.

DETD A hand-held chlorophyll meter SPAD-502 (Minolta--Japan) is used to measure the total chlorophyll level on live transgenic plants and the wild type counterparts a. Three trifoliates from each plant are analyzed, and each trifoliate were analyzed three times. Then 9 data points are averaged to obtain the chlorophyll level. The number of analyzed plants of each genotype ranges from 5 to 8.

DETD . . . as replications. In this analysis, intra and inter-location variances are combined to estimate the standard error of yield from transgenic plants and control plants. Relative mean comparisons are used to indicate statistically significant yield improvements.

DETD Described in this example is a high-throughput method for greenhouse selection of transgenic corn plants to wild type corn plants (tested as inbreds or hybrids) for water use efficiency. This selection process imposes 3 drought/re-water cycles on plants over a total period of 15 days after an initial stress free growth period of 11 days. Each cycle consists. . . quenching on the 5th day of the cycle. The primary phenotypes analyzed by the selection method are the changes in plant growth rate as determined by height and biomass during a vegetative drought treatment. The hydration status of the shoot tissues following the drought is also measured. The plant height are measured at three tine points. The first is taken just prior to the onset drought when the plant is 11 days old, which is the shoot initial height (SIH). The plant height is also measured halfway throughout the drought/re-water regimen, on day 18 after planting, to give rise to the shoot. . . height (SMH). Upon the completion of the final drought cycle on day 26 after planting, the shoot portion of the plant is harvested and measured for a final height, which is the shoot wilt height (SWH) and also measured for shoot. . . for four days, the shoots are weighted for shoot dry biomass (SDM). The shoot average height (SAH) is the mean plant height across the 3 height measurements. The procedure described above may be adjusted for +/-.about.one day for each step given. . .

DETD To correct for slight differences between plants, a size corrected growth value is derived from SIH and SWH. This is the Relative Growth Rate (RGR). Relative Growth. . . each shoot using the formula [RGR %=(SWH-SIH)/((SWH+SIH)/2)*100]. Relative water content (RWC) is a measurement of how much (%) of the plant was water at harvest. Water Content (RwC) is calculated for each shoot using the formula [RWC %=(SWM-SDM)/(STM-SDM)*100]. Fully watered corn plants of this age run around 98% RWC.

DETD On the 10.sup.th day after planting the transgenic positive and wild-type negative (WT) plants are positioned in flats in an alternating pattern. Chlorophyll fluorescence of plants is measured on the 10.sup.th day during the dark period of growth by using a PAM-2000 portable fluorometer as per. . . The flats are

sub-irrigated every day after transfer to the cold temperature. On the 4.sup.th day chlorophyll fluorescence is measured. Plants are transferred to normal growth conditions after six days of cold shock treatment and allowed to recover for the next. . .

DETD . . . leaf necrosis and fluorescence during pre-shock and cold shock can be used for estimation of cold shock damage on corn plants .

DETD . . . conventional-till and simulated no-till environments. Seeds are planted into the ground around two weeks before local farmers are beginning to plant corn so that a significant cold stress is exerted onto the crop, named as cold treatment. Seeds also are planted. . .

DETD . . . 0 in all plots is also recorded. Seedling vigor is also rated at V3-V4 stage before the average of corn plant height reaches 10 inches, with 1=excellent early growth, 5=Average growth and 9=poor growth. Days to 50% emergence, maximum percent emergence. . .

DETD E. Screens for Transgenic Plant Seeds with Increased Protein and/or Oil Levels

DETD This example sets forth a high-throughput selection for identifying plant seeds with improvement in seed composition using the Infratec 1200 series Grain Analyzer, which is a near-infrared transmittance spectrometer used. . .

DETD . . . amino acid sequence for the proteins and homologs encoded by DNA that is used to prepare the transgenic seed and plants of this invention having enhanced agronomic traits.

DETD . . . can be used to identify DNA corresponding to the full scope of this invention that is useful in providing transgenic plants, for example corn and soybean plants with enhanced agronomic traits, for example improved nitrogen use efficiency, improved yield, improved water use efficiency and/or improved growth under cold stress, due to the expression in the plants of DNA encoding a protein with amino acid sequence identical to the consensus amino acid sequence.

DETD . . . 25 Protein of unknown function (DUF1423)

DUF1530	PF07060.1	25	ProFAR isomerase associated
DUF1685	PF07939.1	25	Protein of unknown function (DUF1685)
DUF246	PF03138.4	-15	Plant protein family
DUF250	PF03151.6	125	Domain of unknown function, DUF250
DUF296	PF03479.4	-11	Domain of unknown function (DUF296)
DUF393	PF04134.2	25	Protein of unknown function, DUF393
DUF581	PF04570.4	-3.1	Protein of unknown function (DUF581)
DUF6	PF00892.9	30	Integral membrane protein DUF6
DUF641	PF04859.2	25	Plant protein of unknown function (DUF641)
DUF760	PF05542.1	25	Protein of unknown function (DUF760)
DUF788	PF05620.1	25	Protein of unknown function (DUF788)
Dehydrin	PF00257.8. . .	PF07646.4	20 Kelch motif
Ketoacyl-synt_C	PF02801.10	-54.9	Beta-ketoacyl synthase, C-terminal domain
Kunitz_legume	PF00197.8	-32	Trypsin and protease inhibitor
LEA_5	PF00477.7	25	Small hydrophilic plant seed protein
LIM	PF00412.10	0	LIM domain
LRR_2	PF07723.2	8.7	Leucine Rich Repeat

Lactamase_B PF00753.15 22.3 Metallo-beta-lactamase superfamily
Ldh_1_C PF02866.6 -13 lactate/malate dehydrogenase, alpha/beta
. . .
DETD Selection of Transgenic Plants with Enhanced Agronomic Trait(s)
DETD This example illustrates the preparation and identification by selection of transgenic seeds and plants derived from transgenic plant cells of this invention where the plants and seed are identified by screening a having an enhanced agronomic trait imparted by expression of a protein selected from the group including the homologous proteins identified in Example 4. Transgenic plant cells of corn, soybean, cotton, canola, wheat and rice are transformed with recombinant DNA for expressing each of the homologs identified in Example 4. Plants are regenerated from the transformed plant cells and used to produce progeny plants and seed that are screened for enhanced water use efficiency, enhanced cold tolerance, increased yield, enhanced nitrogen use efficiency, enhanced seed protein and enhanced seed oil. Plants are identified exhibiting enhanced traits imparted by expression of the homologous proteins.
CLM What is claimed is:
23. A plant cell with stably integrated, recombinant DNA comprising a promoter that is functional in plant cells and that is operably linked to DNA encoding a seven-in-absentia protein, wherein said plant cell is present in a plant or seed that (a) exhibits an enhanced trait as compared to control plants that do not have said recombinant DNA; and (b) is derived from a progenitor plant or seed that was selected as having said enhanced trait from a population of plants or seeds that have said recombinant DNA, wherein said enhanced trait is selected from group consisting of enhanced water use. . .
CLM What is claimed is:
24. The plant cell of claim 23 wherein said DNA encoding a seven-in-absentia protein is from a plant, bacteria or yeast and encodes a seven-in-abstentia protein having at least one domain of amino acids in a sequence that. . .
CLM What is claimed is:
25. A plant cell of claim 23 wherein said protein has an amino acid sequence with at least 90% identity to an amino. . .
CLM What is claimed is:
26. A plant cell of claim 23 further comprising DNA expressing a protein that provides tolerance from exposure to an herbicide applied at levels that are lethal to a wild type of said plant cell.

CLM What is claimed is:
27. A plant cell of claim 26 wherein the agent of said herbicide is a glyphosate, dicamba, or glufosinate compound.

CLM What is claimed is:
28. A transgenic plant comprising a plurality of the plant cell of claim 23.

CLM What is claimed is:
29. A transgenic seed comprising a plurality of the plant cell of claim 23.

CLM What is claimed is:
30. A transgenic seed of claim 29 from a corn, soybean, cotton, canola, alfalfa, wheat or rice plant.

CLM What is claimed is:
31. A transgenic pollen grain comprising a haploid derivative of a plant cell of claim 23.

CLM What is claimed is:
32. A method for manufacturing non-natural, transgenic seed that can be used to produce a crop of transgenic plants with an enhanced trait resulting from expression of stably-integrated, recombinant DNA comprising a promoter that is (a) functional in plant cells and (b) is operably linked to DNA from a plant, bacteria or yeast that encodes a seven-in-absentia protein; wherein said enhanced trait is selected from the group of enhanced traits. . . enhanced nitrogen use efficiency, enhanced seed protein and enhanced seed oil; wherein said method comprises: (a) screening a population of plants for said enhanced trait and said recombinant DNA, wherein individual plants in said population can exhibit said trait at a level less than, essentially the same as or greater than the level that said trait is exhibited in control plants which do not express the recombinant DNA, (b) selecting from said population one or more plants that exhibit the trait at a level greater than the level that said trait is exhibited in control plants, (c) verifying that said recombinant DNA is stably integrated in said selected plants, (d) analyzing tissue of a selected plant to determine the production of a seven-in-absentia protein in plant cells of claim 23, and (e) collecting seed from a selected plant.

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=> d his

     (FILE 'HOME' ENTERED AT 02:01:25 ON 11 AUG 2008)

     FILE 'MEDLINE, AGRICOLA, CABA, CAPLUS, BIOSIS, BIOTECHNO' ENTERED AT
     02:01:35 ON 11 AUG 2008
L1           138 S (FRANKARD, V? OR FRANKARD V?)/AU
L2            71 S (CYCLIN(W)DEPENDENT(W)KINASE(W)D) OR CDKD OR (D(W)TYPE(W)CYCL
L3             2 S L1 AND L2
L4             2 DUPLICATE REMOVE L3 (0 DUPLICATES REMOVED)
L5            69 S L2 NOT L1
L6            25 S L5 AND (PLANT OR PLANTS)
L7             8 DUPLICATE REMOVE L6 (17 DUPLICATES REMOVED)
L8             1 S CAK3AT

     FILE 'USPATFULL' ENTERED AT 02:07:14 ON 11 AUG 2008
L9            17 S L1
L10            1 S L3
L11           15 S L2
L12            3 S L11 AND (PLANT OR PLANTS)
L13            2 S L12 NOT L10

=> s l8
L14            0 CAK3AT

=> d his

     (FILE 'HOME' ENTERED AT 02:01:25 ON 11 AUG 2008)

     FILE 'MEDLINE, AGRICOLA, CABA, CAPLUS, BIOSIS, BIOTECHNO' ENTERED AT
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     FILE 'USPATFULL' ENTERED AT 02:07:14 ON 11 AUG 2008
L9            17 S L1
L10            1 S L3
L11           15 S L2
L12            3 S L11 AND (PLANT OR PLANTS)
L13            2 S L12 NOT L10
L14            0 S L8

=> logoff
ALL L# QUERIES AND ANSWER SETS ARE DELETED AT LOGOFF
LOGOFF? (Y)/N/HOLD:y
COST IN U.S. DOLLARS                            SINCE FILE      TOTAL
                                                   ENTRY    SESSION
FULL ESTIMATED COST                                 8.10      68.18

STN INTERNATIONAL LOGOFF AT 02:09:23 ON 11 AUG 2008
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